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Recently there have been a number of reports of swine feeds containing over 1% calcium. Previous research had indicated a high incidence of parakeratosis when diets contained over 1% calcium unless these diets were supplemented with additional zinc. This study was conducted to obtain additional information on the effects of high dietary calcium and different levels of supplemental zinc on performance of growing-finishing swine.

Experimental Procedure

Ninety-six pigs averaging about 48 lb. were allotted on the basis of ancestry, weight and sex to 24 lots of four pigs each. Four replicated lots were assigned to each of six treatments. The pigs were housed in an enclosed confinement building in pens with totally slatted floors.

The dietary treatments were as follows:

1. Low calcium diet (.6% calcium)
2. Low calcium diet plus 40 ppm zinc
3. Low calcium diet plus 90 ppm zinc
4. High calcium diet (1.2% calcium)
5. High calcium diet plus 40 ppm zinc
6. High calcium diet plus 90 ppm zinc

The diets all contained trace mineral salt which supplied 10 parts per million (ppm) of zinc. Supplemental zinc was added as zinc oxide at levels of 40 and 90 ppm. Thus, diets contained 10, 50 or 100 ppm of zinc in addition to that present in the corn and soybean meal. Diets formulated to contain 16% protein were fed until the pigs averaged about 125 lb. at which time the dietary protein content was reduced to 13%. All diets contained .55% phosphorus. Composition of the diets is shown in table 1.

Results

The performance of the pigs by treatment groups is shown in table 2 and the effects of calcium and zinc levels in the diet are summarized in table 3. There were no visible signs of parakeratosis in any of the pigs.

During the growing period from 48 to 125 lb., pigs gained slightly faster as zinc level in the diet increased. This response occurred in both diets of .6 and 1.2% calcium. However, during the finishing period there did not appear to be a consistent difference in rate of gain among treatments. In both the high and low calcium diets, fastest gains were observed when pigs were fed diets of 50 ppm of supplemental zinc. However, pigs fed diets of 100 ppm of supplemental zinc gained no better than those fed 10 ppm of zinc. Feed/gain was less for pigs fed the supplemental zinc diets containing .6% calcium.

When the data were combined, there was no difference in gains of pigs fed .6 or 1.2% calcium. However, those pigs fed the lower level of calcium required approximately 9% less feed per gain (3.36 vs. 3.66 lb. feed/gain). Feed/gain also was improved when 50 or 100 ppm of zinc were supplemented to the diets. Feed/gain were 3.65, 3.42 and 3.48 for pigs fed diets containing 10, 50 or 100 ppm of supplemental zinc, respectively.

Summary

Ninety-six pigs having an initial weight of approximately 48 lb. were used to study the effect of zinc supplementation in diets of .6 and 1.2% calcium. Diets contained 10, 50 and 100 ppm of zinc. Pigs receiving 50 and 100 ppm of supplemental zinc required slightly less feed/gain. There was also an improved feed efficiency when pigs were fed the diet of lower calcium content. This experiment will be repeated in order to obtain additional data on the effects of zinc supplementation at various dietary calcium levels.

Table 1. Composition of Diets (Percent)

	Low calcium		High calcium	
Crude protein, %	16	13	16	13
Corn	77.0	85.4	75.0	83.4
Soybean meal, 44%	20.7	12.2	21.1	12.6
Dicalcium phosphate	1.1	1.3	1.1	1.3
Ground limestone	.7	.6	2.3	2.2
Trace mineral salt[a]	.3	.3	.3	.3
Premix[b]	.2	.2	.2	.2

[a] Supplied 10 ppm of zinc.

[b] Supplied per lb. of diet: vitamin A, 1500 IU; vitamin D, 150 IU; vitamin E, 2.5 IU; vitamin K, 1 mg; riboflavin, 1.25 mg; pantothenic acid, 5 mg; niacin, 8 mg; choline, 25 mg; vitamin B_{12}, 5 mcg; selenium, 45 mcg and aureomycin, 25 milligrams.

Table 2. Performance of Pigs Fed Low and High Calcium Diets With Different Levels of Zinc

	.6% calcium			1.2% calcium		
Zinc, ppm	10	50	100	10	50	100
Number of pigs[a]	16	16	16	16	16	16
Avg. initial wt., lb.	48.8	48.7	48.5	48.1	48.2	48.8
Avg. final wt., lb.	221.3	220.6	217.4	216.8	218.6	218.5
Avg. daily gain, lb.						
48-125 lb.	1.46	1.51	1.55	1.52	1.54	1.59
125-220 lb.	1.69	1.73	1.66	1.58	1.83	1.57
48-220 lb.	1.59	1.63	1.61	1.55	1.70	1.57
Feed/gain						
48-125 lb.	3.10	2.79	2.82	3.24	3.02	3.21
125-220 lb.	3.93	3.58	3.60	4.09	3.94	4.05
48-220 lb.	3.58	3.26	3.25	3.72	3.57	3.70

[a] Four replicate lots of four pigs each per treatment.

Table 3. Effect of Dietary Calcium and Zinc on Performance of Growing-Finishing Pigs

	Calcium, %		Zinc, ppm		
	.6	1.2	10	50	100
No. of pigs	48	48	32	32	32
Avg. initial wt., lb.	48.7	48.4	48.4	48.5	48.7
Avg. final wt., lb.	219.8	218.0	219.1	219.6	217.9
Avg. daily gain, lb.					
48-125 lb.	1.51	1.55	1.49	1.53	1.57
125-220 lb.	1.69	1.66	1.64	1.78	1.62
48-220 lb.	1.61	1.61	1.57	1.66	1.59
Feed/gain					
48-125 lb.	2.95	3.12	3.17	2.91	3.02
125-220 lb.	3.76	4.03	4.01	3.76	3.83
48-220 lb.	3.36	3.66	3.65	3.41	3.48